REMARKS

Reconsideration of this application based on the foregoing Amendment and the following Remarks, in conjunction with the accompanying Request for Approval of Drawing Changes, is respectfully requested.

At the outset, prior to addressing any of the prior art rejections, the applicants call to the Examiner's attention that claims 9, 10 and 13 have been cancelled without prejudice. The applicants have not abandoned the subject matter of claims 9, 10 and 13 and reserve the right to file a continuation application directed thereto.

Response to Arguments

The Examiner indicates that he has considered the applicant's arguments with respect to claims 1-13 but the arguments are moot in view of new grounds of rejection.

Double Patenting: Claim 13

The Examiner now rejects claims 2, 4, 6, 8 and 12 under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

The Examiner alleges that the claim language does not define the recited range of at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$.

In response, the applicants are unclear as to the issue that the Examiner is raising. The applicants respectfully maintain that that claim 2 clearly recites --and *a carrier density* in a flat part of said second cladding layer having a current blocking structure being at least at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$. Therefore, the limitations of at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$

clearly refer to the *carrier density, i.e., the number of carrier atoms per cubic centimeter.*

Therefore, the applicant respectfully requests that the Examiner withdraw the rejection of claims 2, 4, 6, 8 and 12 under 35 U.S.C. 112, second paragraph.

35 U.S.C. 103(a) Rejections: Claims 1-13

The Examiner has rejected claims 1-13 under 35 U.S.C. 103(a) as being unpatentable over Iwamoto et al (US 6,487,226 - filed September 1, 1998 - issued November 26 2002) in view of Hatakoshi et al (US 6,031,858 - filed September 9, 1997 - issued February 29, 2000), Tanaka et al (US 4,961,197 - filed April 14, 1989 - issued October 2, 1990) and Honda et al (US 5,586,136 - filed July 1, 1994 - issued December 17, 1996).

Tanaka et al was previously cited. Iwamoto et al, Hatakoshi et al, and Honda et al are new references.

The applicants call to the Examiner's attention that claims 9, 10 and 13 have been cancelled without prejudice.

Regarding claims 1 and 11, the Examiner asserts that Iwamoto et al illustrate in FIG. 1 a semiconductor laser having a cladding layer (2), an active layer (4) with quantum well layers (4a), a cladding layer (6) and a current blocking layer (9). The Examiner asserts that column 5, line 25 describes the active layer as having three to seven quantum well layers (4); column 5, lines 24-25, describe the cladding layer (6) as having a thickness of 0.3 μm. The Examiner further asserts that cladding (6) has current blocking structure on the flat portion, as described in column 5, lines 9-10, as having an impurity concentration of $1 \times 10^{18}/ cm^3$.

The Examiner concedes that Iwamoto et al do not disclose the cladding layer with a current blocking structure on the flat portion as having a carrier density in the range of at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$. The Examiner asserts however that Hatakoshi et al, column 19, lines 4-35, disclose that a cladding layer having a low carrier concentration an overflow of electrons from the active layer to the cladding layer occurs, where a low carrier concentration is defined as $1x10^{17}cm^{-3}$, and that to prevent the overflow of electrons, a carrier blocking or concentration of $1x10^{17}cm^{-3}$ or more should be used.

The Examiner asserts therefore that it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide the cladding layer of Iwamoto et al with a carrier concentration of $1x10^{17}cm^{-3}$ or more.

In response, the applicants maintain that neither Iwamoto et al nor Hatakoshi et al, taken alone or in combination, disclose, teach or suggest the combined limitations of claims 1 and 11 of the number of said quantum wells being at least 5 and no greater than 10; and a layer thickness of a flat part of said second cladding layer having a current blocking structure being at least 300nm and no greater than 500nm; and a carrier density in said flat part of said second cladding layer having a current blocking structure being at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$ for claim 1 and no greater than $3x10^{17}cm^{-3}$ for claim 11.

The new and unexpected results of the simultaneous application of the foregoing limitations of claims 1 and 11 are disclosed in FIGS. 2(a) to 2(c) of the drawings and the corresponding discussion beginning on page 6, line 16, to page 8, line 2. The combined limitations provide stable self-sustained pulsating operation at high temperatures. The self-sustained pulsating laser diode of the present

invention of claims 1 and 11 achieves performance that is suitable for application to optical discs at a high temperature, and to application for DVDs for car navigation systems, and DVD-ROMs and the like for notebook personal computers. Together with the limitations on the number of active well layers and the cladding thickness, if the carrier density falls outside the range of at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$ for claim 1 and no greater than $3x10^{17}cm^{-3}$ for claim 11, the self-sustained pulsating operation is weakened as clearly shown in FIGS. 2(a) to 2(c).

As a result of the new and unexpected results, one of ordinary skill in the art would not have been motivated to combine the teachings of Iwamoto et al with those of Hakatoshi et al to achieve the present invention of claims 1 and 11. Even if one of ordinary skill in the art were somehow motivated to combine the teachings of Iwamoto et al with those of Hakatoshi et al, the hypothethical device resulting from such a combination would not yield the advantages of the present invention of claims 1 and 11.

Consequently, the applicants respectfully request that the Examiner withdraw the rejections of claims 1, 3, 5, 7 and 11 over the prior art.

Regarding claims 2 and 12, the Examiner asserts that Iwamoto et al disclose all of the limitations of claims 2 and 12 except for the semiconductor laser having a refractive index of at least $7x10^{-4}$ and no greater than $3x10^{-3}$. The Examiner asserts however that Tanaka et al, column 4, lines 67-68, and column 5, lines 1-4, disclose a stabilized self sustained pulsation semiconductor may be obtained by controlling the refractive index below the ridge stripe within the range of $8x10^{-4}$ to $5x10^{-3}$.

The Examiner asserts that therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the refractive

index of Iwamoto et al to within a range of $8x10^{-4}$ to $5x10^{-3}$ because it would have provided a stabilized self-sustained pulsation semiconductor laser, as disclosed by Tanaka et al.

In response, the applicants maintain that claims 2 and 12 recite an effective refractive index difference parallel to the layers (Δn) being at least $7x10^{-4}$ and no greater than $3x10^{-3}$, and a carrier density in a flat part of said second cladding layer having a current blocking structure being at least $1x10^{17}cm^{-3}$ and no greater than $5x10^{17}cm^{-3}$ for claim 2 and less than $3x10^{17}cm^{-3}$ for claim 12.

The applicant maintains it would have been obvious to one of ordinary skill in the art at the time the invention was made that the effective refractive index difference parallel to the layers (Δn) is functionally equivalent to combination of the number of quantum wells and the layer thickness of the flat part of said second cladding layer having a current blocking structure as recited by claims 1 and 11.

Therefore, the applicant maintains that neither Iwamoto et al nor Hatakoshi et al nor Tanaka et al, taken alone or in combination, disclose, teach or suggest the combined limitations of claims 2 and 12 which provide the same new and unexpected results of FIGS. 2(a) to 2(c) and the specification beginning on page 6, line 16, to page 8, line 2, as discussed previously with respect to claims 1 and 11.

As a result of the new and unexpected results, one of ordinary skill in the art would not have been motivated to combine the teachings of Iwamoto et al with those of Hakatoshi et al and Tanaka et al to achieve the present invention of claims 2 and 12. Even if one of ordinary skill in the art were somehow motivated to combine the teachings of Iwamoto et al with those of Hakatoshi et al and Tanaka et al, the hypothetical device resulting from such a combination would not yield the

advantages of the present invention of claims 2 and 12.

Consequently, the applicants respectfully request that the Examiner withdraw the rejections of claims 2, 4, 6, 8 and 12 over the prior art.

The foregoing amendments and remarks establish the patentable nature of all of the claims remaining in the application, i.e., claims 1-8 and 11-12. No new matter has been added. Wherefore, early and favorable reconsideration and issuance of a Notice of Allowance are respectfully requested.

Respectfully submitted,

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